NATIONAL SURVEY OF BURNER-FUEL OILS, 1955

BY O. C. BLADE

Information Circular 7730

UNITED STATES DEPARTMENT OF THE INTERIOR
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CONTENTS

	Page
Introduction	1
Summary	4
Explanation of tables and figures	4

TABLES

1.	Summary of grade 1 burner-fuel oils	2
2.	Summary of grade 2 burner-fuel oils	2
3.	Summary of grade 4 burner-fuel oils	3
4.	Summary of grade 5 burner-fuel oils	3
5.	Summary of grade 6 burner-fuel oils	3
6.	Analyses of grade 1 burner-fuel oils	7
7.	Analyses of grade 2 burner-fuel oils	10
8.	Analyses of grade 4 burner-fuel oils	14
9	Analyses of grade 5 burner-fuel oils	16
10.	Analyses of grade 6 burner-fuel oils	18

ILLUSTRATIONS

Fig.		Follows page
1.	Geographical areas for the National Survey of Burner-Fuel Oils, 1955	4

1/ Chemist (Petroleum)

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INTRODUCTION

This survey report, the first for this type of fuel, is issued to provide information on the characteristics of the burner-fuel oils now manufactured for sale. Reports of surveys of diesel fuel, conducted under a cooperative agreement between the American Petroleum Institute and the Bureau of Mines, United States Department of the Interior, have been published annually since 1950. 2/ This survey of burner-fuel oils is similar to the diesel-fuel surveys in pattern and has been conducted under an extension of the same agreement at the request of the Oil-Heat Institute of America and the petroleum industry. It is not intended to conflict with the diesel-fuel survey but rather to supplement it. Burner-fuel oils, also specifically referred to as heating oil, range oil, furnace oil, "Bunker C," and fuel oil, are sold in increasing volumes for use in this country and for export. Sales of all grades of fuel oil in the United States have increased from 340 million barrels in 1926 3/ to over a billion barrels per year. 4/ Distillate fuel oil sales, in proportion to total fuel-oil volume sold, increased from 42 percent in 1950 to 50 percent in 1954. Sales of distillate and the heavier residual oils during recent years are shown:

	Fuel-oil sales, thousands of barrels 4/				
	1950	1951	1952	1953	1954 5/
Distillate fuel oil	395,306	448,908	497,210	488,844	526,245
Residual fuel oil	554,208	563,388	556,273	564,729	522,714
Total	949,514	1,012,296	1,053,483	1,053,573	1,048,959

It must be realized that the data given are not accurate indications of the use of these materials as burner fuels. Some burner fuel, used as range oil, is kerosine, which is not included above. A large volume of fuel oil--approximately 30 percent of the distillate type and some residual fuel oil--is sold as diesel fuel. Smaller

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2/ Blade, O. C., National Annual Diesel-Fuel Surveys, 1950-54: Bureau of Mines Reports of Investigations 4746, 25 pp.; 4830, 1951, 12 pp.; 4935, 1952, 22 pp.; 5008, 1953, 24 pp.; 5084, 1954, 24 pp. (In cooperation with the American Petroleum Institute).

3/ Coumbe, A. T. and Avery, I. F., A Quarter Century of Fuel-Oil Sales, 1926-50: Bureau of Mines Information Circular 7630, 1952, 100 pp.

4/ Coumbe, A. T. and Avery, I. F., Sales of Fuel Oil and Kerosine in 1954. Distillate and Kerosine Sales Increase; Residual Grades Decline: Bureau of Mines Mineral Report 2412, 1955, 16 pp.

5/ Preliminary figures on demand, subject to revision.

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TABLE 1.--Summary of grade 1 fuels, burner-fuel oil survey, 1955

Geographic distribution of burner-fuel oils 1/		Eastern Region			Southern region			Central region			Rocky Mountain region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts 2/		D,E,G			A,B,C,E,G			C,D,E,I,K,L			E,F,G,L,M			F,H,I,K		
Number of fuels		25			8			35			19			15		
Test	A.S.T.M.	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Gravity ° A.P.I.	D287	40.6	43.6	48.5	41.2	42.7	44.6	38.8	42.3	44.6	39.1	42.3	44.6	35.2	38.5	42.7
Flash point, Tag closed tester ° F.	D56	114	-	150	128	-	146	122	-	162	120	-	150	125	-	185
Viscosity																
Kinematic at 100° F. centistokes	D445	1.42	1.64	2.0	1.59	1.72	1.9	1.54	1.79	2.3	1.47	1.67	1.99	1.54	1.89	2.2
Cloud test ° F.	D97	-56	-	0	-44	-	< 0	-56	-	20	<-50	-	-10	-56	-	-20
Pour point do.	D97	-60	-	< 0	-55	-	-35	-60	-	-10	-55	-	-20	<-60	-	<-20
Sulfur content wt. percent	D129	0.025	0.089	0.272	0.025	0.048	0.10	0.025	0.140	0.50	0.018	0.147	0.377	0.01	0.222	0.44
Aniline point ° F.	D611	143.5	151.1	168.8	146	150	152	135.9	149.6	159	135.9	145.9	155	120	139.4	155
Ramsbottom carbon residue																
on 10 percent residuum percent	D524	0.00	0.059	0.13	0.01	0.051	0.13	0.01	0.067	0.123	0.002	0.056	0.105	0.03	0.075	0.11
Corrosion, 3 hours at 122° F.	D130	0	-	1	0	-	1	0	-	1	0	-	1	0	-	2
Ash percent	D482	0.000	0.000	0.001	0.00	0.000	<0.001	0.000	0.000	0.004	0.00	0.000	0.001	0.00	0.000	<0.01
Water and sediment vol. percent	D96	0.00	0.00	< 0.1	0.00	0.00	< 0.1	0.00	0.00	Trace	0.00	0.00	Trace	0.00	0.00	Trace
Distillation test,	D86															
on volume recovered basis:																
Initial boiling point ° F.		320	341	366	332	345	366	317	347	387	317	349	382	323	350	396
10 percent		350	376	399	364	379	392	360	385	423	360	385	410	362	399	420
50 percent		397	424	462	416	427	448	416	437	464	403	431	461	410	447	466
90 percent		443	488	540	468	492	524	468	506	540	465	495	551	451	508	549
End point		496	531	576	502	527	550	502	548	585	496	545	580	487	553	586

TABLE 2.—Summary of grade 2 fuels, burner-fuel oil survey, 1955

Geographic distribution of burner-fuel oils 1/		Eastern region			Southern region			Central region			Rocky Mountain region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts 2/		D,E,G			A,B,C,E,G			B,C,D,H,I,K,L			E,F,G,L,M			F,H,I,K		
Number of fuels		40			11			36			17			20		
Test	A.S.T.M.	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Gravity ° A.P.I.	D287	29.0	35.9	44.7	30.3	34.8	36.9	29.5	35.4	39.5	25.8	35.9	41.8	25.8	34.1	41.8
Flash point, Pensky-Martens closed tester ° F.	D93	126	-	206	134	-	172	134	-	218	135	-	210	134	-	230
Viscosity																
Kinematic at 100° F. centistokes	D445	2.05	2.61	3.30	2.05	2.44	2.92	2.05	2.54	3.34	1.77	2.55	3.65	1.60	2.97	4.3
Cloud test ° F.	D97	-15	-	18	-2	-	12	-22	-	15	-40	-	5	-40	-	28
Pour point do.	D97	-20	-	10	-10	-	0	-25	-	0	-40	-	0	<-60	-	20
Sulfur content wt. percent	D129	0.03	0.325	0.80	0.05	0.339	0.60	0.056	0.330	0.96	0.05	0.443	0.99	0.17	0.471	0.87
Aniline point ° F.	D611	118.0	145.4	176.0	118.0	139.1	156	116	140.1	165	87	139.4	160	87	139.4	160
Ramsbottom carbon residue																
on 10 percent residuum percent	D524	0.003	0.115	0.25	0.03	0.123	0.23	0.03	0.122	0.24	<0.06	0.098	0.22	<0.06	0.097	0.17
Corrosion, 3 hours at 122° F.	D130	0	-	1	0	-	4	0	-	1	0	-	1	0	-	2
Ash percent	D482	0.000	0.001	0.01	0.0	0.003	0.01	0.000	0.001	0.01	0.000	0.000	0.000	0.00	0.000	<0.01
Water and sediment vol. percent	D96	0.00	0.00	<0.1	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	Trace	0.00	0.00	Trace
Distillation test,	D158															
on volume recovered basis:																
Initial boiling point ° F.		318	355	460	321	340	370	300	358	460	329	371	405	336	375	440
10 percent		368	425	486	373	415	438	368	424	491	393	432	464	384	439	490
50 percent		461	501	538	480	499	513	468	502	544	439	495	521	410	504	558
90 percent		555	584	630	565	587	618	537	578	618	464	567	624	451	582	648
End point		592	638	668	613	640	675	558	625	675	510	617	676	487	636	708

1/ Regions and districts are shown on map (fig. 1).

2/ Some of the fuels are sold in districts of more than one region.

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TABLE 3.--Summary of grade 4 fuels, burner-fuel oil survey, 1955

Geographic distribution of burner fuel oils 1/		Eastern region			Southern region			Central region			Rocky Mountain region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts 2/		D,E			B			H,K,L			F,L			F,H,I,K		
Number of fuels		17			3			3			4			3		
Test	A.S.T.M.	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Gravity ° A.P.I.	D287	12.8	22.1	33.3	14.5	20.8	26.5	14.5	18.7	24.0	14.5	26.0	35.9	14.5	23.2	30.0
Flash point, Pensky-Martens closed tester ° F.	D93	160	-	230	154	-	225	156	-	240	200	-	240	160	-	240
Viscosity																
Kinematic at 100° F. centistokes	D445	7.09	17.20	25.0	5.8	13.9	25	14.2	17.9	22.6	6.45	16.1	22.6	10.2	16.4	22.6
Cloud test ° F.	D97	10	-	34	-	3/ 20	-	-	-	-	-	3/ 10	-	-	3/ 10	-
Pour point do.	D97	<-45	-	20	-15	-	15	-40	-	0	-40	-	70	-40	-	0
Sulfur content wt. percent	D129	0.28	0.826	2.05	0.19	0.50	1.0	0.43	1.45	3.27	0.10	1.74	3.27	1.00	2.12	3.27
Aniline point ° F.	D611	117.2	(4)	178.7	-	3/ 163	-	-	-	-	-	3/ 142	-	-	3/ 142	-
Ramsbottom carbon residue																
on 100 percent sample percent	D524	0.45	3.11	6.05	0.10	1.61	4.24	5.0	5.95	7.6	0.06	3.40	7.6	0.06	2.99	7.6
Corrosion, 3 hours at 122° F.	D130	-	-	1	-	-	3/ 5	-	-	-	3/ 0	-	-	3/ 0	-	-
Ash percent	D482	0.000	0.012	0.042	0.001	0.002	0.005	0.007	0.011	0.018	0.00	0.010	0.03	0.00	0.010	0.02
Water and sediment vol. percent	D96	0.00	0.15	0.44	-	Trace	-	0.2	0.30	0.7	0.0	0.05	0.1	0.0	0.03	0.10
Distillation test,	D158															
on volume recovered basis:																
Initial boiling point ° F.		351	(4)	440	-	3/ 382	-	-	-	-	466	(4)	504	-	3/ 504	-
10 percent		447	-	514	-	500	-	-	-	-	498	-	534	-	534	-
50 percent		534	-	640	-	610	-	-	-	-	570	-	585	-	570	-
90 percent		716	-	748	-	700	-	-	-	-	630	-	744	-	630	-
End point		718	-	842	-	>760	-	-	-	-	686	-	>760	-	686	-

TABLE 4.--Summary of grade 5 fuels, burner-fuel oil survey, 1955

Geographic distribution of burner fuel oils 1/		Eastern region			Southern region			Central region			Rocky Mountain region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts 2/		D,E,G			A,B,C,G			C,D,H,I,K,L			E,F,G,L			F,H,I,K		
Number of fuels		13			4			19			9			14		
Test	A.S.T.M.	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Gravity ° A.P.I.	D287	2.3	15.2	19.5	14.4	16.4	18.0	2.3	13.1	22.0	4.8	11.0	20.2	10.1	14.3	18.5
Flash point, Pensky-Martens closed tester ° F.	D93	132	-	260	198	-	220	158	-	255	130	-	306	130	-	306
Viscosity																
Kinematic at 100° F. centistokes	D445	36.4	73.2	116.5	38.38	71.6	130	46.06	76.9	130	47.32	(4)	162	77.7	(4)	162
Furol at 122° F. seconds	D88	15.6	24.6	40.0	15	24	35	11	24.4	38	18	30.1	40	22.5	32.5	40
Pour point ° F.	D97	-20	-	40	-15	-	40	-15	-	40	-15	-	60	-20	-	40
Sulfur content wt. percent	D129	0.43	0.96	2.06	0.73	1.67	2.70	0.50	1.39	3.40	0.810	2.38	4.8	0.5	1.97	4.8
Ramsbottom carbon residue																
on 100 percent sample percent	D524	2.69	5.98	10.13	3.8	5.55	8.64	3.8	7.43	11.8	0.61	5.57	10.2	3.80	8.34	14.4
Ash percent	D482	0.008	0.024	0.053	0.026	0.039	0.05	0.003	0.044	0.19	0.002	0.025	0.09	0.01	0.037	0.07
Water and sediment vol. percent	D96	0.10	0.33	0.8	0.10	0.30	0.8	0.1	0.25	0.8	Trace	0.13	0.2	Trace	0.13	0.20

TABLE 5.--Summary of grade 6 fuels, burner-fuel oil survey, 1955

Geographic distribution of burner fuel oils 1/		Eastern region			Southern region			Central region			Rocky Mountain region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts 2/		D,E,G,J			A,B,C,E,G,J			C,D,H,K,L			A,B,D,E,F,L			F,H,I,K		
Number of fuels		35			14			28			17			24		
Test	A.S.T.M.	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Gravity ° A.P.I.	D287	3.6	11.8	17.5	6.2	10.6	13.9	-1.1	10.3	23.2	4.5	10.0	20.2	7.8	9.9	15.6
Flash point, Pensky-Martens closed tester ° F.	D93	154	-	290	152	-	230	160	-	430	150	-	420	150	-	420
Viscosity																
Furol at 122° F. seconds	D88	64	169.9	290	70	165.3	240	70	195.3	295	51.2	167.7	276.1	70	148.9	236
Pour point ° F.	D97	10	-	80	10	-	80	20	-	80	20	-	60	5	-	60
Sulfur content wt. percent	D129	0.56	1.44	3.63	0.45	1.55	2.86	0.60	1.38	3.46	0.40	2.14	5.25	0.5	1.97	5.25
Ramsbottom carbon residue																
on 100 percent sample percent	D524	2.78	10.19	22.65	4.5	10.86	22.65	1.30	12.41	20.9	0.61	10.40	21.20	3.75	12.91	18.1
Ash percent	D482	0.0	0.044	0.15	0.010	0.076	0.15	0.014	0.150	1.9	0.006	0.055	0.4	0.01	0.051	0.11
Water and sediment vol. percent	D96	0.04	0.29	0.75	0.05	0.283	0.60	0.1	0.32	0.8	Trace	0.42	1.8	0.03	0.20	0.9

1/ Regions and districts are shown on map (fig. 1).
2/ Some of the fuels are sold in districts of more than one region.
3/ Result of test on one sample only.
4/ No average was determined as an insufficient number of samples was represented.

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amounts, particularly of the light distillate oil, also are prepared for use as spray oils (insecticides), smudge-pot fuel, adsorption oil, and some as components of jet fuel. Figures indicating recent sales of burner-fuel oil for heating--domestic and industrial, manufacturing processes, steam generation, metallurgy, and similar purposes--are not readily available. The total volumes of distillate and residual fuel oils now comprise virtually 40 percent of the crude oil refined. The importance of these materials has resulted in the need for more information by the petroleum industry, manufacturers of heating appliances, and consumers regarding the types and qualities of such fuels currently being marketed.

Samples of burner-fuel oil typical of their manufacture during the early part of 1955 were analyzed by the refiners in accordance with instructions from the subcommittee on fuel surveys of the Automotive Research Committee of the American Petroleum Institute. Results of the analyses were transmitted to the Bureau of Mines where the data were studied and compiled as shown in the tables of this report.

SUMMARY

Data on a total of 341 samples of burner-fuel oil are represented. The fuels were manufactured by 35 petroleum refining companies, large and small, in 97 refineries throughout the country. The data are divided into 5 groups according to the stated grade of burner-fuel oil, and each group is subdivided into 5 tabulations according to the geographic marketing distribution of the various fuels represented. The geographic areas are 5 general regions of the country containing 14 districts in which the burner-fuel oils are marketed. The areas are shown on the map (fig. 1) and are the same as used in the current diesel-fuel surveys.

Summaries of the results of the tests by grades and by regions are shown in tables 1 through 5. Average values of selected properties are shown for the number of fuels represented, and minimum and maximum figures are given for all the tests indicated, where possible.

EXPLANATION OF TABLES AND FIGURES

Twelve laboratory tests, selected by the subcommittee on fuels surveys of the Automotive Research Committee of the A.P.I. in consultation with the subcommittee on fuel oil characteristics of the Oil-Heat Institute Technical Division and made by procedures approved by the American Society for Testing Materials, 6/ were used to analyze the samples of burner-fuel oils in this survey. By agreement with the cooperating agencies, identification of the items is confidential.

6/ American Society for Testing Materials, ASTM Standards, Part 5, Philadelphia, 1952, 1,350 pp.

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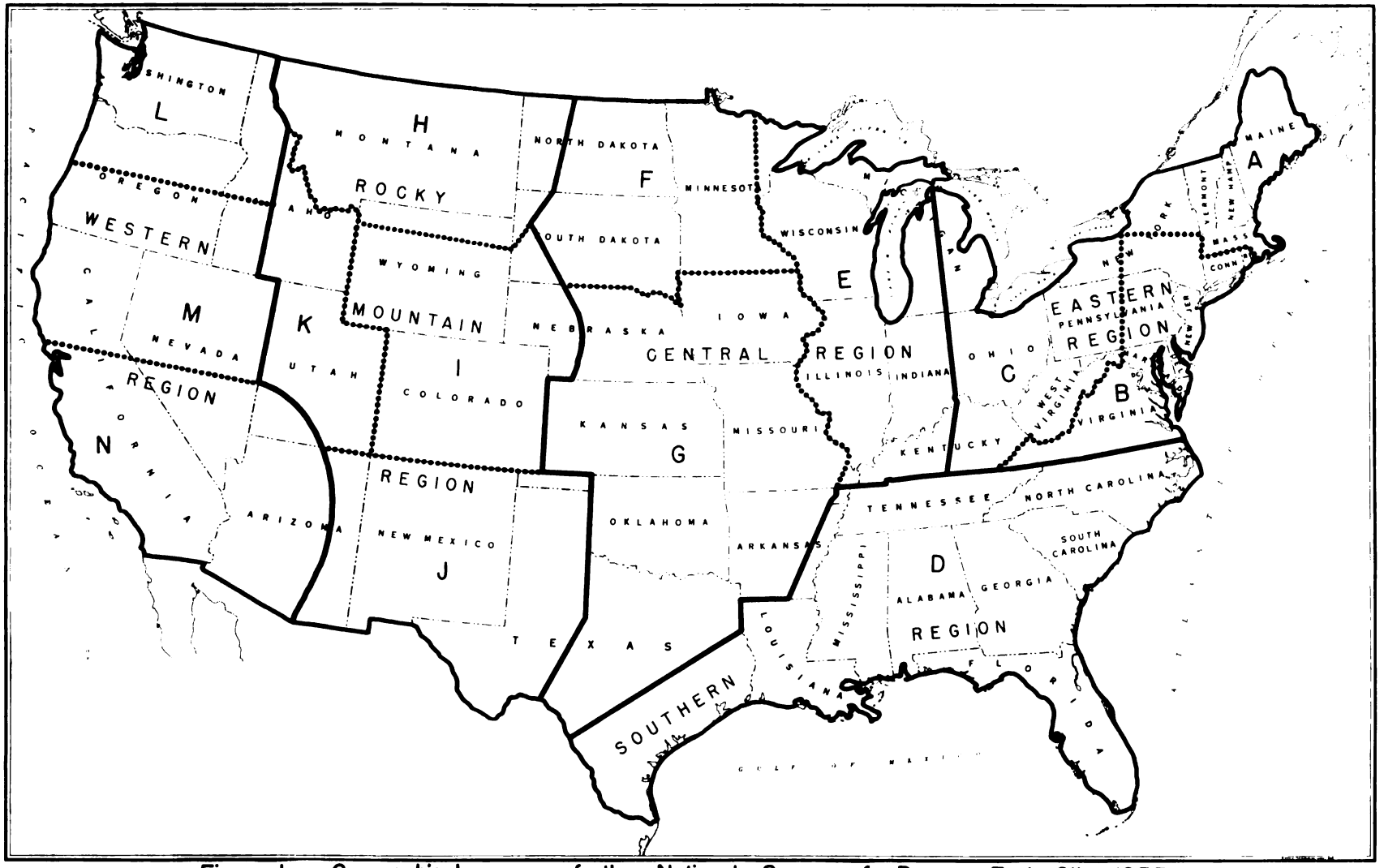

Figure 1. – Geographical areas of the National Survey of Burner-Fuel Oils, 1955.

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Each item in tables 6 through 10 is a complete analysis of one sample of burner-fuel oil. The tables are arranged in five groups, according to the grade designations 1, 2, 4, 5, and 6 stated by the manufacturer. Each group of data is subdivided into five tabulations according to the geographic marketing distribution of the fuels represented. The geographic areas are made up of 5 general regions divided into 14 marketing districts as follows:

Region	Districts
Eastern	A, B, C
Southern	D
Central	E, F, G
Rocky Mountain	H, I, J, K
Western	L, M, N

The regions and districts are indicated in figure 1. These areas were established by a study committee of the A.P.I. and are based on fuel-distribution systems, refinery locations, centers of population, temperature zones, and arteries of commerce, such as navigable waters. The districts are the same as now used for the diesel-fuel surveys but are different from those of the motor-gasoline surveys. 7/

The data in tables 6 through 10 are arranged, within each grade group, according to the regions where the fuels are sold. In each regional tabulation the districts where each fuel is sold are given in the second column. The listing of the districts indicates in decreasing order the relative volume of sales for each fuel. Thus, the first district listed is that in which the greatest volume of a fuel is sold, and the analysis of this fuel is tabulated in the first section of data under the region containing that district. The second section of data, separated by a line from the first section, contains analyses of fuels that are sold in greatest volume in districts of other regions. The first section of data in each regional tabulation might be considered to represent fuels of major distribution and the second section to represent fuels of minor distribution for that particular region. It is possible that the sales volume of a given fuel may be highest in a district of one region but that the total sales in districts of another region may be greater. Consider, for example, a fuel distributed in districts C, E, and F. The greatest sales volume might be in district C of the Eastern region, but the combined sales in districts E and F of the Central region could be higher. This fuel would be listed as a fuel of major distribution in the Eastern region and as a fuel of minor distribution in the Central region. It is believed, however, that in most cases the region of greatest sales volume will contain the district of greatest sales volume.

7/ Blade, O. C., National Motor-Gasoline Survey, Winter 1954-55: Bureau of Mines Report of Investigations 5146, 1955, 24 pp. (In cooperation with the American Petroleum Institute).

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The first column of these tables shows item numbers of the analyses, each of which represents one sample of burner-fuel oil. The same item number in different tables indicates that this fuel is sold in more than one region, and the analytical data are repeated.

The column headings for the data show the primary ASTM designations of the test procedures. If a test was made by another procedure, the exception is indicated with a footnote. Viscosities of grades 1, 2, 4, and 5 burner-fuel oils were determined in centistokes at 100° F. Viscosities of grades 5 and 6 fuels were determined in Saybolt Furol seconds at 122° F.

Occasionally a certain property of a fuel, other than distillation temperature, is not within the limits of the specification of its grade. 8/ That figure is noted as not included in the average. Most such exceptions are viscosity, sulfur content, and carbon residue. Some of the values were determined to the nearest whole unit and therefore have no decimal. Distillation data are shown by ASTM Method D86 for grade 1 burner-fuel oils and by ASTM D158 for grade 2 fuels, and for grade 4 fuels where given.

Average values of eight or less selected characteristics of all the burner-fuel oils indicated in each of tables 6 through 10 have been computed where possible and are shown at the bottoms of the respective tables. Averages for flash point, cloud test, pour point, and corrosion are not given. Minima and maxima are shown for all the properties.

Summaries of the results of this survey are shown in tables 1, 2, 3, 4, and 5.

8/ American Society for Testing Materials, Tentative Specifications for Fuel Oils (D396-48T): ASTM Standards on Petroleum Products and Lubricants, Philadelphia, 1954, pp. 181-183.

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TABLE 6.—Analyses of grade 1 burner fuel oils, 1955

Eastern region: Districts A, B, and C

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D56 °F.	Viscosity Kinematic at 100° F. A.S.T.M. D445 cs.	Cloud test A.S.T.M. D97 °F.	Pour point A.S.T.M. D97 ° F.	Sulfur content A.S.T.M. D129 percent	Aniline point A.S.T.M. D611 °F.	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 10 percent residuum, percent	Corrosion A.S.T.M. D130 3 hours at 122° F.	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %	Distillation 3/ A.S.T.M. D86 Temperature, °F. % recovered IBP	10	50	90	End point
1	A,B,D	43.3	132	1.59	-44	-55	0.04	-	0.13	1A	<0.001	<0.1	332	372	420	486	518
2	B,A,C	44.0	124	1.50	<-50	<-50	-	147.2	.09	1	-	.0	327	354	407	475	520
3	B,A,D	41.2	134	1.72	<-20	-	.065	-	.07	1	-	-	346	384	440	508	546
4	B,C	42.2	126	1.7	-10	-20	.05	145	.08	1	-	.0	340	375	430	500	540
5	B,D,A	43.1	130	1.7	-30	-40	.05	146	.04	1	-	.0	344	376	422	488	540
6	C	43.2	4/ 134	-	-	<-20	.065	148.6	.00	0	—	.0	342	377	418	470	518
7	C	45.0	4/ 142	1.47	-	<-20	.064	153	.08	0	.003	.0	353	379	418	484	525
8	C	42.6	4/ 135	1.77	-30	-30	.07	-	.08	-	—	.0	341	380	430	491	526
9	C	43.2	4/ 138	-	-	< 0	.09	147	.003	1	.000	.0	349	371	412	474	511
10	C	47.4	142	1.43	-30	-40	.05	156	.02	1	.000	.0	356	380	406	443	496
11	C	46.5	114	1.63	<-20	<-20	.12	168.8	-	1	.00	.0	345	399	428	475	508
12	C	44.8	118	1.45	<-15	<-20	.11	145.8	.06	1A	—	.0	323	350	397	474	538
13	C	45.6	124	5/ 1.27	< 0	< 0	.10	145	.070	1A	.00	.0	332	360	400	458	500
14	C	48.5	132	1.42	-50	-60	.03	159.8	.00	1	.000	.00	332	358	408	463	525
15	C	46.1	140	1.68	-	-	.048	159.6	.06	1	.0	.0	351	377	429	493	542
16	C,E	42.1	126	1.69	<-10	<-10	.13	146.5	.082	1A	.001	.0	336	372	428	514	576
17	C,E	43.4	125	1.57	-56	-60	.219	143.5	.080	1A	-	.0	342	384	428	484	532
18	C,E	44.1	4/ 136	1.7	<-25	<-25	.214	-	.07	1	.000	.0	320	365	424	496	552
19	D,B,A	41.8	133	1.68	< 0	-	.025	-	.01	1	-	-	347	378	422	478	510
20	D,B,A,C	42.2	133	-	-	-	.035	-	-	1	-	.00	337	380	448	524	550
25	B,C	42.6	122	-	<-30	<-30	.272	146.5	-	1A	-	Trace	326	362	428	500	560
26	B,C	41.7	147	-	-	-35	.11	153.8	-	1	-	.0	350	395	450	516	560
27	B,C	40.6	150	2.0	-10	-30	.043	157	.07	1A	.00	.0	346	394	462	540	568
28	B,C,D	42.8	140	1.77	-10	-35	.043	150	.06	1A	.00	.0	366	392	423	468	502
29	B,C,G	42.3	144	-	-	-	.10	-	.08	1	-	-	350	392	434	494	518
Average (25 samples)		43.6	-	1.64	-	-	0.089	151.1	0.059	-	0.000	0.00	341	376	424	488	531
Minimum		40.6	114	1.42	-56	-60	0.025	143.5	0.00	0	0.000	0.00	320	350	397	443	496
Maximum		48.5	150	2.0	0	< 0	.272	168.8	.13	1	.001	< .1	366	399	462	540	576

Southern region: District D

19	D,B,A	41.8	133	1.68	< 0	-	0.025	-	0.01	1	-	-	347	378	422	478	510
20	D,B,A,C	42.2	133	-	-	-	.035	-	-	1	-	0.00	337	380	448	524	550
21	D,G,E	42.2	146	1.65	-30	-35	.028	150	.01	0	0.0	.0	351	382	427	488	524
1	A,B,D	43.3	132	1.59	-44	-55	.04	-	.13	1A	< .001	<.1	332	372	420	486	518
3	B,A,D	41.2	134	1.72	<-20	-	.065	-	.07	1	-	-	346	384	440	508	546
5	B,D,A	43.1	130	1.7	-30	-40	.05	146	.04	1	-	.0	344	376	422	488	540
28	B,C,D	42.8	140	1.77	-10	-35	.043	150	.06	1A	.00	.0	366	392	423	468	502
40	G,D,E	44.6	128	1.9	-25	-35	.10	152	.04	1	.00	.0	338	364	416	494	524
Average (8 samples)		42.7	-	1.72	-	-	0.048	150	0.051	-	0.000	0.00	345	379	427	492	527
Minimum		41.2	128	1.59	-44	-55	0.025	146	0.01	0	0.00	0.00	332	364	416	468	502
Maximum		44.6	146	1.9	< 0	-35	.10	152	.13	1	< .001	< .1	366	392	448	524	550

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 18 and 19 in the Eastern region and items 21 and 1 in the Southern region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Distillation figures have been converted, where necessary, to temperatures at 760 mm. Hg according to table 1 in A. S. T. M. D86-52.

4/ Flash point by Pensky-Martin closed tester, A. S. T. M. D93-52.

5/ Not within specification of fuels for this grade, figure not included in average.

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TABLE 6.—Analyses of grade 1 burner-fuel oils, 1955 (Cont.)

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D56 °F.	Viscosity Kinematic at 100° F. A.S.T.M. D445 cs.	Cloud test A.S.T.M. D97 °F.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Aniline point A.S.T.M. D611 °F.	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 10 percent residuum, percent	Corrosion A.S.T.M. D130 3 hours at 122° F.	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %	Distillation 3/ A.S.T.M. D86 Temperature, °F. % recovered IBP	10	50	90	End point
22	E	42.6	130	1.70	-30	-35	0.08	150	0.09	0	-	Trace	334	365	430	521	565
23	E	42.3	138	1.74	-35	-40	.10	147	.08	1A	0.00	0.0	347	387	436	514	585
24	E	40.1	130	2.10	-	-10	.50	-	.08	1	.000	.00	320	418	464	518	590
25	E,G	42.6	122	-	<-30	< -30	.272	146.5	-	1A	-	Trace	326	362	428	500	560
26	E,G	41.7	147	-	-	-35	.11	153.8	-	1	-	.0	350	395	450	516	560
27	E,G	40.6	150	2.0	-10	-30	.043	157	.07	1A	.00	.0	346	394	462	540	568
28	E,G,D	42.8	140	1.77	-10	-35	.043	150	.08	1A	.00	.0	366	392	423	468	502
29	E,G,G	42.3	144	-	-	-	.10	-	.08	1	-	-	350	392	434	498	518
30	E,G	42.6	130	-	-30	-35	.134	150.8	.06	1A	-	-	348	371	423	501	549
31	E,G	41.9	128	1.71	<-10	< -10	.48	146.1	.060	1	.000	.00	338	370	432	516	566
32	E,G,F	38.8	162	2.0	-20	-30	.430	139	.12	0	.004	.00	387	423	451	495	528
33	E,G,F	42.3	133	1.64	<-30	< -30	4/ .09	147.6	.06	1	.000	.00	346	378	422	470	510
34	E,G,F	40.8	146	2.09	-45	< -30	4/ .11	152.2	.06	1	.000	.00	358	404	458	536	570
35	F,E,G	42.2	136	1.91	-	-30	.18	-	.05	0	.00	.0	344	383	436	522	550
36	F,G,E	44.1	133	-	20	-30	.09	154	-	1	.000	.0	342	365	418	517	567
37	F,E,E	42.9	123	1.6	-	-20	.071	-	.02	1A	-	-	317	360	416	494	548
38	G	41.7	5/ 138	6/ 2.3	-	-40	.12	159	.05	1	-	.0	358	398	450	510	558
39	G	42.3	138	1.76	-36	-45	.05	150	.07	1	.0	.0	344	396	438	498	538
40	G,D,E	44.6	128	1.9	-25	-35	.10	152	.04	1	.00	.0	338	364	416	494	524
41	G,E,F	41.7	143	1.88	-	-25	4/ .100	153.0	.123	1	.000	.0	359	398	452	512	546
42	G,E,F	43.0	130	1.6	-35	-40	.06	140	.07	1	.00	.0	344	374	436	540	565
43	G,E,F	42.2	146	1.86	-26	-35	.04	154.5	.05	1A	—	.0	364	396	448	520	562
44	G,F	42.2	145	1.89	-35	-40	.08	151.8	.068	1	—	.0	368	398	444	510	560
45	G,F,E	43.6	131	1.8	-	< -40	.130	-	.06	1A	—	.00	347	374	425	484	535
46	G,F,E	42.7	128	2.1	-	-25	.072	150.1	.12	1A	—	.0	330	376	434	498	542
47	G,F,E	41.7	148	1.60	-34	-60	.083	-	.095	1	.000	.0	364	387	428	473	514
48	G,F,E	43.8	148	1.90	-24	-30	.10	156	.03	0	-	.0	368	393	436	523	553
49	G,F,E	42.3	140	1.72	-20	-25	.025	154	.07	0	.00	.0	346	391	450	530	560
50	G,F,E,I	42.7	150	1.80	-20	-25	.107	152	.01	0	.00	.0	365	405	449	499	528
16	G,E	42.1	126	1.69	<-10	< -10	.13	146.5	.082	1A	.001	.0	336	372	428	514	576
17	G,E	43.4	125	1.57	-56	-60	.219	143.5	.080	1A	-	.0	342	384	428	484	532
18	G,E	44.1	5/ 136	1.7	<-25	< -25	.214	-	.07	1	.000	.0	380	395	428	496	552
21	D,G,E	42.2	146	1.65	-30	-35	.028	150	.01	0	.0	.0	351	382	427	488	524
58	E,K,L,F	41.2	125	1.54	<-50	< -50	.372	135.9	.105	1	-	.0	332	362	420	502	535
62	I,G	41.4	146	1.6	-44	-55	.05	147	.06	1	.00	.0	360	401	461	540	575
Average (35 samples)		42.3	-	1.79	-	-	0.140	149.6	0.067	-	0.000	0.00	357	395	457	506	548
Minimum		38.8	122	1.54	-56	-60	0.025	135.9	0.01	0	0.000	0.00	317	360	416	468	502
Maximum		44.6	162	2.10	20	-10	.50	159	.123	1	.004	Trace	387	423	464	540	585
Rocky Mountain region: Districts E, I, J, and K																	
51	E	41.6	145	1.68	-40	-40	0.377	138	0.082	0	0.00	0.0	375	390	431	491	533
52	E	44.0	134	1.60	-35	-45	.23	142	.05	1	.0	.0	352	371	405	466	510
53	E	43.8	136	1.47	< -30	< -30	7/ .086	-	.08	1	.00	.0	346	370	409	469	496
54	E	41.7	148	1.73	<-30	< -30	7/ .248	-	.08	1	.00	.0	362	391	439	516	567
55	E	43.5	8/ 150	1.6	-	-40	.05	-	.06	-	.00	.0	335	365	405	465	532
56	E,I	41.2	143	1.81	-	-25	.227	143.8	.09	1A	-	.0	382	401	432	485	542
57	E,K,L,I	39.1	150	1.6	-40	-55	6/ .9%	136	< .06	0	.00	.0	378	410	446	493	534
58	E,L,K,F	41.2	125	1.54	< -50	< -50	.372	135.9	.105	1	-	.0	332	362	420	502	535
59	I	42.2	150	1.99	-	-30	4/ .032	148.7	.065	1	.001	.00	357	405	443	502	546
60	I	42.1	135	-	<-20	< -20	.018	148.5	.06	1	Trace	Trace	353	395	440	489	527
61	I	42.0	127	1.7	-18	-20	.03	148	.06	1	.00	.0	333	370	436	552	580
62	I,G	41.4	146	1.6	-44	-55	.05	147	.06	1	.00	.0	360	401	461	540	575
63	I,K	44.6	126	1.94	<-25	< -25	.21	146	.034	0	-	.0	347	368	403	493	569
64	J	43.3	138	1.70	-32	-35	.096	146.2	.08	1	.00	.0	353	393	433	489	524
65	J	42.2	120	1.51	-10	< -50	.093	142.6	.06	1	-	.0	336	369	416	482	571
66	K,L	41.6	5/ 140	1.8	-40	-40	.23	152.2	.06	1A	.00	.00	340	393	450	503	574
67	K,L,N	41.9	134	1.80	-20	-40	.11	155	.04	0	.00	.0	325	399	440	486	558
37	F,E,E	42.9	123	1.6	-	-20	.071	-	.02	1A	-	-	317	360	416	494	548
50	G,F,E,I	42.7	150	1.80	-20	-25	.107	152	.01	0	.00	.0	365	405	449	499	528
Average (19 samples)		42.1	-	1.67	-	-	0.147	145.9	0.056	-	0.000	0.00	346	385	431	495	545
Minimum		39.1	120	1.47	<-50	-55	0.018	135.9	0.002	0	0.00	0.00	317	360	403	465	496
Maximum		44.6	150	1.99	-10	-20	.377	155	.105	1	.001	Trace	382	410	461	551	580

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Western region: Districts L, M, and N

68	L,N	35.3	5/ 152	2.00	-	<-60	0.20	-	0.07	-	-	Trace	360	407	454	508	570
69	L,N	36.0	5/ 150	2.05	<-30	<-40	.21	130	.08	2	0.00	Trace	360	412	466	533	580
70	L,N,M	42.7	137	1.61	-56	-60	.01	154.3	.03	1	.00	0.0	360	394	435	476	504
71	L,N,M	39.7	156	2.01	-36	-40	.25	143.1	.06	1	.00	.0	396	414	449	503	545
72	L,M	35.2	5/ 162	2.19	<-30	<-40	6/ .72	132	.06	2	.00	.00	368	404	460	549	586
73	L,M	37.7	5/ 140	2.00	-	<-20	.44	-	.11	1	<.01	Trace	336	403	454	514	563
74	M	36.5	185	2.2	-30	-40	.40	140	.09	1	-	.00	365	420	460	525	560
75	M	38.2	5/ 144	2	-38	-40	.1	139	.08	1	.00	.0	330	410	454	510	554
76	M,L,N	37.5	5/ 134	2	<-40	<-40	.3	135	.1	1	.00	.0	323	392	450	526	568
77	M,N	36.3	5/ 134	1.60	<-30	<-40	.17	120	.08	2	.00	.00	348	384	410	451	487
78	M,N,L	38.0	5/ 128	2	-24	-35	.1	140	.1	1	.00	.00	330	384	450	535	570
57	N,K,L,I	39.1	150	1.6	-40	-55	6/ .94	136	<.06	0	.00	.0	372	410	446	493	534
58	N,L,K,F	41.2	125	1.54	<-50	<-50	.372	135.9	.105	1	-	.0	332	362	420	502	535
66	K,L	41.8	5/ 140	1.8	-40	-40	.23	152.2	.06	1A	.00	.00	340	393	450	503	574
67	K,L,M	41.9	134	1.80	-20	-40	.11	155	.04	0	.00	.0	325	399	440	486	558
Average (15 samples)		38.5	-	1.89	-	-	0.222	139.4	0.075	-	0.000	0.00	350	399	447	508	553
Minimum		35.2	125	1.54	-56	<-60	0.01	120	0.03	0	0.00	0.00	323	362	410	451	487
Maximum		42.7	185	2.2	-20	<-20	.44	155	.11	2	<.01	Trace	396	420	466	549	586

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 50 and 16 in the Central region, items 67 and 37 in the Rocky Mountain region, and items 78 and 57 in the Western region are generally sold in greatest volumes in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Distillation figures have been converted, where necessary, to temperatures at 760 mm. Hg according to table 1 in A. S. T. M. D86-52.

4/ Determined by CO_2-O_2 lamp method, A. S. T. M. D1266-53T modified.

5/ Flash point by Pensky-Martin closed tester, A. S. T. M. D93-52.

6/ Not within specification of fuels for this grade, figure not included in average.

7/ Determined by lamp method, A. S. T. M. D90-50T.

8/ Flash point by Tag open-cup apparatus, A. S. T. M. D1310-54T.

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TABLE 7.—Analyses of grade 2 burner-fuel oils, 1955

Eastern region: Districts A, B, and C

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 °A.P.I	Flash point A.S.T.M. D93 °F.	Viscosity kinematic at 100° F. A.S.T.M. D445 cs.	Cloud test A.S.T.M. D97 °F.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Aniline point A.S.T.M. D611 °F.	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 10 percent residuum, percent	Corrosion A.S.T.M. D130 3 hours at 122° F.	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %	Distillation 3/ A.S.T.M. D158 Temperature, °F. IBP	% recovered 10	50	90	End point
79	B	29.0	180	2.69	10	0	0.80	132	0.20	0	0.000	0.00	359	446	538	610	665
80	B	33.3	148	3.0	0	-10	4/ 1.15	128.5	.05	1	-	.0	340	406	490	580	650
81	B,A	33.2	150	2.51	4	-5	.55	132.8	.25	1	.002	.00	326	408	506	596	652
82	B,A	33.1	168	2.97	-	5	.14	-	.11	1	.0	.0	372	444	512	596	646
83	B,A	32.7	170	2.55	-6	-15	.29	-	.18	1A	<.001	<.1	380	434	490	563	605
84	B,A,C	38.4	166	2.4	-6	-5	.59	152.6	.10	1	.000	.04	368	428	493	582	636
85	B,A,C	35.2	150	2.26	0	-10	.13	138.6	.19	1	-	Trace	336	414	488	570	646
86	B,A,C,D	32.8	158	-	-	-5	.495	-	.16	1	-	.0	338	420	513	596	645
87	B,A,D	34.9	158	2.31	0	-5	.60	-	.23	1	-	-	330	422	496	578	626
88	B,C	35.0	156	2.69	10	0	.60	148	.15	0	.000	.00	345	430	510	600	668
89	B,C	37.5	176	2.71	6	0	.30	156	.13	0	.000	.00	360	440	515	580	665
90	B,C	35.8	140	2.3	10	0	.45	138	.15	1	-	.0	325	410	495	590	630
91	B,D,A	35.7	142	2.3	10	0	.54	131	.10	1	-	.0	322	408	495	578	630
92	B,D,A	34.6	156	2.75	4	-5	.48	143	.10	4	.001	.00	328	426	508	594	644
93	B,D,E	36.6	134	2.05	5	0	.17	143	.16	1	.01	.01	321	373	487	571	638
94	C	33.7	158	2.59	-	0	.29	134.6	.003	-	-	.0	330	432	510	570	622
95	C	39.0	160	2.59	-	0	.28	159	.12	0	.004	.0	365	426	506	604	658
96	C	33.8	150	3.30	8	0	.25	-	4/ .36	-	.0	.05	330	410	492	555	637
97	C	34.7	166	2.8	-	-5	.25	139	.12	-	.000	Trace	367	436	515	594	626
98	C	44.0	168	2.3	-4	-15	.07	166	.03	1	.000	.0	364	409	468	574	609
99	C	41.6	205	3.2	18	10	.07	176	.04	1	.000	.0	444	464	510	630	661
100	C	44.7	126	2.09	-8	-15	.14	174.2	.02	1	.00	.0	318	410	461	556	629
101	C	42.0	158	2.52	8	0	.09	166.1	.04	0	-	.00	366	420	494	584	639
102	C	40.2	160	2.75	12	0	.13	164.8	.06	1	.0	.0	367	435	507	582	622
103	C	36.0	148	2.44	6	0	.25	143.6	.14	1A	-	.0	351	411	502	603	664
104	C	37.2	186	2.93	6	0	.24	160	.062	1A	.00	.0	380	458	516	578	620
105	C	33.4	160	3.30	6	0	.30	126	.089	1A	.00	.0	342	424	501	578	620
106	C	44.2	155	2.54	-8	0	.03	176.0	.01	1	.000	.00	352	403	485	588	658
107	C,E	29.5	206	3.24	7	0	.21	120.0	.180	1A	.001	.0	460	486	530	590	648
108	C,E	38.1	150	3.17	6	0	.284	158.5	.097	1A	-	.0	352	448	532	599	649
109	C,E	33.6	162	2.47	0	-5	.478	153.8	.10	1	.000	.0	368	448	514	572	622

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111	D,B,A	33.5	172	2.59	-	-5	.15	-	.06	1	-	-	346	430	511	577	613
112	D,B,A	34.8	158	2.3	10	0	.13	135	.23	1	.0	.0	370	424	480	580	640
113	D,E,C	30.3	162	2.45	0	-10	.5	118.0	.10	0	-	.0	352	438	510	600	640
116	E,C	35.5	141	2.19	-15	-20	.24	127	.10	1A	-	.0	356	429	485	567	621
117	E,C	37.1	2/ 133	2.11	-	-15	.437	139.5	-	1A	-	Trace	342	368	468	568	622
118	E,C	33.7	149	2.7	-	-5	.54	124.0	-	1	-	.0	358	426	503	556	592
119	E,C	36.8	174	2.64	0	-10	.125	154	.08	1B	.00	.0	382	437	492	580	648
120	E,C,G	37.5	152	2.38	12	0	.30	144	.12	0	-	Trace	337	397	505	599	644
121	E,C,G	33.8	174	-	4	0	.8	141	.18	1	-	-	386	420	520	610	664
Average (40 samples)		35.9	-	2.61	-	-	0.325	145.4	0.115	-	0.001	0.00	355	425	501	584	638
Minimum		29.0	126	2.05	-15	-20	0.03	118.0	0.003	0	0.000	0.00	318	368	461	555	592
Maximum		44.7	206	3.30	18	10	.80	176.0	.25	1	.01	< .1	460	486	538	630	668

Southern region: District D

110	D	36.9	168	2.38	-2	0	0.05	146.8	0.08	1	-	0.00	354	427	491	565	627
111	D,B,A	33.5	172	2.59	-	-5	.15	-	.06	1	-	-	346	430	511	577	613
112	D,B,A	34.8	158	2.3	10	0	.13	135	.23	1	0.0	.0	370	424	480	580	640
113	D,E,C	30.3	162	2.45	0	-10	.5	118.0	.10	0	-	.0	352	438	510	600	640
114	D,G,E	36.9	146	2.92	6	0	.056	156	.03	0	.0	.0	344	409	500	599	660
86	B,A,C,D	32.8	158	-	-	-5	.495	-	.16	1	-	.0	338	420	513	596	645
87	B,A,D	34.9	158	2.31	0	-5	.60	-	.23	1	-	-	330	422	496	578	626
91	B,D,A	35.7	142	2.3	10	0	.54	131	.10	1	-	.0	322	408	495	578	630
92	B,D,A	34.6	156	2.75	4	-5	.48	143	.10	4	.001	.00	328	426	508	594	644
93	B,D,E	36.6	134	2.05	5	0	.17	143	.16	1	.01	.01	321	373	487	571	638
132	G,D	36.0	150	2.39	12	0	.56	140.2	.10	1	-	.00	335	386	500	618	675
Average (11 samples)		34.8	-	2.44	-	-	0.339	139.1	0.123	-	0.003	0.00	340	415	499	587	640
Minimum		30.3	134	2.05	-2	-10	0.05	118.0	0.03	0	0.0	0.00	321	373	480	565	613
Maximum		36.9	172	2.92	12	0	.60	156	.23	4	.01	.01	370	438	513	618	675

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 109 and 111 in the Eastern region and items 114 and 86 in the Southern region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Distillation figures have been converted, where necessary, to temperatures at 760 mm. Hg according to table 1 in A. S. T. M. D86-52.

4/ Not within specification of fuels for this grade, figure not included in average.

5/ Flash point by Tag closed tester, A. S. T. M. D56-52.

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TABLE 7.—Analyses of grade 2 burner-fuel oils, 1955 (Cont.)

Central region: Districts E, F, and G

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity, Kinematic at 100° F. A.S.T.M. D445 cs.	Cloud test A.S.T.M. D97 °F.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Aniline point A.S.T.M. D611 °F.	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 10 percent residuum, percent	Corrosion A.S.T.M. D130 3 hours at 122° F.	Ash A.S.T.M. D482 percent	Water and sediment A.S.T.M. D96 vol. %	Distillation 3/ A.S.T.M. D158 Temperatures, °F. IBP	% recovered 10	50	90	End point
115	E	38.2	145	2.65	4	-10	0.31	153.5	0.16	1	0.000	0.00	309	424	494	610	644
116	E,G	35.5	141	2.19	-15	-20	.24	127	.10	1A	-	.0	356	429	485	567	621
117	E,G	37.1	4/ 133	2.11	-	-15	.437	139.5	-	1A	-	Trace	342	368	468	568	622
118	E,G	33.7	149	2.7	-	-5	.54	124.0	-	1	-	.0	358	426	503	556	592
119	E,G	36.8	174	2.64	0	-10	.125	154	.08	1B	.00	.0	382	437	492	580	648
120	E,G,G	37.5	152	2.38	12	0	.30	144	.12	0	-	Trace	337	397	505	599	644
121	E,G,G	33.8	174	-	4	0	.8	141	.15	1	-	-	366	420	520	610	664
122	E,G	29.6	160	2.5	0	-5	.96	116	.14	1	.00	.0	332	428	544	590	628
123	E,G	38.2	4/ 133	2.38	-	-10	.240	140.5	.09	1A	-	.0	350	394	472	574	620
124	E,G	37.6	158	2.83	15	0	.68	158.0	.070	0	.001	.00	346	418	514	610	670
125	E,G,F	37.8	170	3.3	5	-10	.352	153	.08	0	.005	.0	385	443	501	594	652
126	E,G,F	36.4	166	2.38	-5	-15	5/ .19	143.6	.09	1	.000	.00	368	430	486	556	619
127	F,E,G	33.6	143	2.33	-	-5	.29	-	.15	0	.00	.0	340	393	505	583	620
128	F,G,E	33.3	170	2.57	5	-5	.29	124	.169	1	.000	Trace	373	441	505	578	632
129	F,E,E	35.5	4/ 142	2.38	-	-20	.295	-	.098	1A	-	-	335	399	494	579	633
130	G	34.7	160	2.6	-	-5	.20	129	.16	1	-	.0	354	440	496	576	628
131	G	37.5	218	3.34	-5	-5	.12	165	.09	1	.0	.0	450	491	520	565	620
132	G,D	36.0	150	2.39	12	0	.56	140.2	.10	1	-	.00	335	386	500	618	675
133	G,E,F	34.1	172	2.55	-	-5	5/ .284	130.7	.24	1	.000	.00	366	430	509	564	590
134	G,E,F	37.7	158	2.24	6	-10	.2	142	.17	1	.00	.0	330	399	483	568	631
135	G,E,F	31.9	162	2.43	-4	-5	.22	124.0	.11	1A	-	.0	348	433	508	562	598
136	G,F	33.0	162	2.39	0	-5	.18	121.0	.20	1	-	.0	378	437	500	550	586
137	G,F,E	35.8	4/ 132	2.38	-	-5	.355	-	.06	1A	-	.00	331	426	505	570	613
138	G,F,E	35.9	4/ 141	2.7	-	-5	.254	150.8	.15	1A	-	Trace	338	428	506	572	612
139	G,F,E	36.5	182	2.19	-22	-25	.309	-	.152	1	.001	.0	401	431	483	537	558
140	G,F,E	34.5	160	2.52	2	-5	.21	139	.10	0	-	.0	360	425	515	573	610
141	G,F,E	33.5	160	2.38	2	-5	.12	130	.11	0	.00	.0	350	432	510	578	625
142	G,F,E,I	36.6	160	2.21	-10	-15	.268	145	.08	0	.00	.0	365	430	484	540	587
93	B,D,E	36.6	134	2.05	5	0	.17	143	.15	1	.01	.01	321	373	487	571	638
107	C,E	29.5	206	3.24	7	0	.21	120.0	.180	1A	.001	.0	460	486	530	590	648
108	C,E	38.1	150	3.17	6	0	.284	158.5	.097	1A	-	.0	352	448	532	599	649
109	C,E	33.6	162	2.47	0	-5	.478	153.8	.10	1	.000	.0	368	448	514	572	622
113	D,E,C	30.3	162	2.45	0	-10	.5	118.0	.10	0	-	.0	352	438	510	600	640
114	D,G,E	36.9	146	2.92	5	0	.056	156	.03	0	.0	.0	344	409	500	599	660
146	H,L,K,F	36.5	160	2.52	-18	-20	.78	144.7	.130	1	-	.0	358	414	508	579	606
149	I,G	39.5	156	2.3	-10	-15	.07	155	.08	1	.00	.0	359	430	485	555	599
Average (36 samples)		35.4	-	2.54	-	-	0.330	140.1	0.122	-	0.001	0.00	358	424	502	578	625
Minimum		29.5	134	2.05	-22	-25	0.056	116	0.03	0	0.000	0.00	300	368	468	537	558
Maximum		39.5	218	3.34	15	0	.96	165	.24	1	.01	.01	460	491	544	618	675

Rocky Mountain region: Districts H, I, J, and K

143	H	35.5	4/ 160	2.8	-	0	0.60	-	0.06	1	0.00	0.0	390	460	515	590	650
144	H,I	35.7	4/ 176	2.38	-	-20	.490	132.9	.12	1A	-	.0	405	430	473	567	620
145	H,K,L,I	34.4	168	2.6	-5	-15	6/ 1.3	138	<.06	0	.00	.0	382	433	519	624	676
146	H,L,K,F	36.5	160	2.52	-18	-20	.78	144.7	.130	1	-	.0	358	414	508	579	606
147	I	35.5	176	1.77	-	-40	5/ .131	108.3	.174	1	.000	.00	394	422	439	464	510

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148	I	40.5	135	2.1	-5	-10	.05	158	.06	1	.00	.0	329	403	505	570	600
149	I,G	39.5	156	2.3	-10	-15	.07	155	.08	1	.00	.0	359	430	485	555	599
150	I,K	37.8	164	2.79	0	-10	.64	154	.088	0	-	.0	380	432	503	586	626
151	I,K	35.7	166	2.81	5	-5	.74	148	.11	0	-	.0	384	431	504	582	620
152	J	36.9	185	-	15	-10	.36	152.3	.06	1	.000	.0	387	440	511	604	661
153	K	28.8	186	2.70	-2	-10	.72	106.7	.22	1A	.00	Trace	397	464	515	563	622
154	K,L	41.8	140	1.8	-40	-40	.23	152.2	.06	1A	.00	.00	340	393	450	503	574
155	K,L	37.3	158	2.60	2	-10	.37	149.0	.09	1A	.00	.00	357	435	494	574	645
156	K,L,M	36.9	168	3.37	2	-5	.35	160	.07	0	.00	.0	363	458	521	580	629
157	K,L,M	25.8	210	3.65	-30	-35	.99	87	.10	0	.00	.0	380	463	503	572	635
129	F,H,E	35.5	4/ 142	2.38	-	-20	.295	-	.098	1A	-	-	335	399	494	579	633
142	G,F,E,I	36.6	160	2.21	-10	-15	.268	145	.08	0	.00	.0	365	430	484	540	587
Average (17 samples)		35.9	-	2.55	-	-	0.443	139.4	0.098	-	0.000	0.00	371	432	495	567	617
Minimum		25.8	135	1.77	-40	-40	0.05	87	<0.06	0	0.000	0.00	329	393	439	464	510
Maximum		41.8	210	3.65	5	0	.99	160	.22	1	.000	Trace	405	464	521	624	676

Western region: Districts L, M, and N

158	L,M	35.3	152	2.00	-	<-60	0.20	-	0.07	-	-	Trace	360	407	454	508	570
159	L,M	31.7	186	3.80	20	0	-	-	-	-	-	do	402	464	546	648	704
160	L,M	36.0	150	2.05	<-30	<-40	.21	130	.08	2	0.00	do	360	412	466	533	580
161	L,M	30.6	174	3.60	10	0	.52	136	.06	2	.00	do	378	455	540	618	670
162	L,M	35.2	162	2.19	<-30	<-40	.72	132	.06	2	.00	0.00	368	404	460	549	586
163	L,M	30.7	200	3.95	15	5	6/ 1.04	140	.06	2	.00	.00	410	470	538	634	698
164	L,M	37.7	140	2.00	-	<-20	.44	-	.11	1	<.01	Trace	336	403	454	514	563
165	M	34.2	174	3.5	22	20	.2	152	.16	1	.00	.0	378	454	536	642	708
166	M	32.0	230	4.3	10	0	.65	155	.10	1	-	.00	440	490	550	625	675
167	M,L	33.0	180	3.2	12	5	.87	-	.17	1	<.01	Trace	372	451	535	627	695
168	M,L,N	31.8	176	3.4	5	0	.7	140	.17	1	.00	.0	370	466	536	607	649
169	M,N	36.3	134	1.60	<-30	<-40	.17	120	.08	2	.00	.00	348	384	410	451	487
170	M,N	33.2	160	3.00	10	0	.31	145	.06	2	.00	.00	374	438	507	621	686
171	M,N,L	31.1	206	4.3	28	20	.3	149	.15	1	.00	.00	428	488	558	627	674
145	H,K,L,I	34.4	168	2.6	-5	-15	6/ 1.3	138	<.06	0	.00	.0	382	433	519	624	676
146	H,L,K,F	36.5	160	2.52	-18	-20	.78	144.7	.130	1	-	.0	358	414	508	579	606
154	K,L	41.8	140	1.8	-40	-40	.23	152.2	.06	1A	.00	.00	340	393	450	503	574
155	K,L	37.3	158	2.60	2	-10	.37	149.0	.09	1A	.00	.00	357	435	494	574	645
156	K,L,M	36.9	168	3.37	2	5	.35	160	.07	0	.00	.0	363	458	521	580	629
157	K,L,M	25.8	210	3.65	-30	-35	.99	87	.10	0	.00	.0	380	463	503	572	635
Average (20 samples)		34.1	-	2.97	-	-	0.471	139.4	0.097	-	0.000	0.00	375	439	504	582	636
Minimum		25.8	134	1.60	-40	<-60	0.17	87	<0.06	0	0.00	0.00	336	384	410	451	487
Maximum		41.8	230	4.3	28	20	.87	160	.17	2	<.01	Trace	440	490	558	648	708

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 142 and 93 in the Central region, items 157 and 129 in the Rocky Mountain region, and items 171 and 145 in the Western region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Distillation figures have been converted, where necessary, to temperatures at 760 mm. Hg according to table 1 in A. S. T. M. D86-52.

4/ Flash point by Tag closed tester, A. S. T. M. D56-52.

5/ Determined by CO_2-O_2 lamp method, A. S. T. M. D1266-53T.

6/ Not within specification of fuels for this grade, figure not included in average.

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TABLE 5.--Analyses of grade 4 burner-fuel oils, 1955

Eastern region: Districts A, B, and C

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity, kinematic at 100° F. A.S.T.M. D445 cs.	Cloud test A.S.T.M. D97 °F.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Aniline point A.S.T.M. D611 °F.	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 100 percent sample, percent	Corrosion A.S.T.M. D130 3 hours at 122° F.	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %	Distillation 3/ A.S.T.M. D158 Temperature, °F. % recovered IBP	10	50	90	End point
172	A,B	14.1	225	15.2	-	-30	0.81	-	3.50	-	0.006	0.2	424	-	-	-	-
173	A,B	12.8	210	18.9	-	<-45	.95	-	4.66	1	.00	.3	416	514	640	(4)	-
174	B	13.9	>200	16.8	-	-45	.81	-	-	-	.005	.4	440	520	636	(5)	-
175	B	22.3	170	21.0	10	< 0	2.05	-	5.49	-	.03	.10	-	-	-	-	-
176	B	22.6	196	6/ 5.29	-	-15	.5	117.2	7/ .45	1	.004	.00	8/370	458	534	720	842
177	B	17.9	200	25.0	-	-10	2.0	-	6.05	-	.025	.15	-	-	-	-	-
178	B	22.4	176	18.4	-	-15	.60	-	3.4	-	.02	.1	-	-	-	-	-
179	B,A,C	22.0	184	23.5	-	5	.28	-	2.27	-	.02	.2	-	-	-	-	-
180	B,C	23.1	> 200	19	-	10	1.60	-	2.10	-	.02	.2	-	-	-	-	-
181	C	22.0	212	19.10	-	0	.52	-	4.02	-	-	.2	-	-	-	-	-
182	C	31.1	230	9.2	-	0	.42	-	1.36	-	.000	.1	-	-	-	-	-
183	C	33.0	205	8.86	34	20	.30	178.7	9/ -	1	.0	.0	415	544	632	748	>760
184	C	33.3	160	7.09	24	0	.33	172.9	10/ -	1	.0	.0	351	447	626	716	718
185	C	22.7	182	20.57	-	10	.58	-	4.83	-	.008	.2	-	-	-	-	-
186	C	16.2	160	22.9	-	-25	.444	-	2.03	-	.011	.1	-	-	-	-	-
187	C,E	24.2	180	18.72	-	10	.830	-	2.93	-	.042	.2	-	-	-	-	-
190	D,B	21.5	154	11.0	-	0	1.0	-	.48	-	.001	Trace	-	-	-	-	-
Average (17 samples)		22.1	-	17.20	-	-	0.836	-	3.11	-	0.012	0.15	-	-	-	-	-
Minimum		12.8	160	7.09	10	<-45	0.28	117.2	0.45	-	0.000	0.00	351	447	534	716	718
Maximum		33.3	230	25.0	34	20	2.05	178.7	6.05	1	.042	.44	440	544	640	748	842

Southern region: District D

188	D	26.5	188	5.8	20	15	0.30	163	10/ 0.10	5	0.001	Trace	382	500	610	700	>760
189	D	14.5	225	25	-	-15	.19	-	4.24	-	.005	do	-	-	-	-	-
190	D,B	21.5	154	11.0	-	0	1.0	-	.48	-	.001	do	-	-	-	-	-
Average (3 samples)		20.8	-	13.9	-	-	0.50	-	1.61	-	0.002	Trace	-	-	-	-	-
Minimum		14.5	154	5.8	-	-15	0.19	-	0.10	-	0.001	-	-	-	-	-	-
Maximum		26.5	225	25	-	15	1.0	-	4.24	5	.005	-	-	-	-	-	-

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Central region: Districts E, F, and G

191	E	24.0	167	17	-	-25	0.41	-	5.0	-	0.007	0.2	-	-	-	-	-	
192	E	17.7	156	14.2	-	0	.66	-	5.25	-	.018	.7	-	-	-	-	-	
194	H,L,K,F	14.5	240	22.6	-	-40	3.27	-	7.6	-	.009	Trace	-	-	-	-	-	
Average (3 samples)		18.7	-	17.9	-	-	1.45	-	5.95	-	0.011	0.30	-	-	-	-	-	
Minimum		14.5	156	14.2	-	-40	0.41	-	5.0	-	0.007	0.2	-	-	-	-	-	
Maximum		24.0	240	22.6	-	0	3.27	-	7.6	-	.018	.7	-	-	-	-	-	

Rocky Mountain region: Districts H, I, J, and K

193	H,K,L,I	30.0	200	6/ 4.2	10	0	2.1	142	0.06	0	0.00	0.0	504	534	570	630	686	
194	H,L,K,F	14.5	240	22.6	-	-40	3.27	-	7.6	-	.009	Trace	-	-	-	-	-	
195	I,J,K	35.9	240	6.45	-	70	.10	-	-	-	.03	.1	466	498	585	744	>760	
196	J	23.6	200	19.1	-	-20	1.49	-	2.55	-	Trace	.1	-	-	-	-	-	
Average (4 samples)		26.0	-	16.1	-	-	1.74	-	3.40	-	0.010	0.05	-	-	-	-	-	
Minimum		14.5	200	6.45	-	-40	0.10	-	0.06	-	0.00	0.0	466	498	570	630	686	
Maximum		35.9	240	22.6	-	70	3.27	-	7.6	-	.03	.1	504	534	585	744	>760	

Western region: Districts L, M, and N

197	N	25.0	160	10.2	-	-10	1.00	-	1.30	-	0.02	0.10	-	-	-	-	-	
193	H,K,L,I	30.0	200	6/ 4.2	10	0	2.1	142	.06	0	.00	.0	504	534	570	630	686	
194	H,L,K,F	14.5	240	22.6	-	-40	3.27	-	7.6	-	.009	Trace	-	-	-	-	-	
Average (3 samples)		23.2	-	16.4	-	-	2.12	-	2.99	-	0.010	0.03	-	-	-	-	-	
Minimum		14.5	160	10.2	-	-40	1.00	-	0.06	-	0.00	0.0	-	-	-	-	-	
Maximum		30.0	240	22.6	-	0	3.27	-	7.6	-	.02	.10	-	-	-	-	-	

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 187 and 190 in the Eastern region, items 192 and 194 in the Central region and items 197 and 193 in the Western region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Distillation figures have been converted, where necessary, to temperatures at 760 mm. Hg according to table 1 in A. S. T. M. D86-52.

4/ 688° F. at 96.5 percent recovered. 5/ Cracking. 6/ Not within specification of fuels for this grade, figure not included in average.

7/ Ramsbottom carbon residue on 10% residuum, 1.80 percent.

8/ Equivalent distillation temperatures at 760 mm. Hg converted from figures at 10 mm. pressure according to chart (fig. 5) in the report by Beale, H.S.L., and Docksey, P., A Wide Range Boiling-Point Conversion Chart for Hydrocarbons and Petroleum Products; Jour. Inst. Petrol. Technol., vol. 21, 1935, pp. 860-870.

9/ Ramsbottom carbon residue on 10% residuum, 0.26 percent. 10/ Ramsbottom carbon residue on 10% residuum, 0.24 percent.

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TABLE 9.—Analyses of grade 5 burner-fuel oils, 1955

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 °A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity: Kinematic at 100° F. A.S.T.M. D445 cs.	Viscosity: Furol at 122° F. A.S.T.M. D88 Sec.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 100 percent sample, percent	Ash A.S.T.M. D482 percent	Water and sediment A.S.T.M. D96 vol.%
Eastern region: Districts A, B, and C										
198	B	16.9	205	73.4	22.0	10	2.06	7.02	0.030	0.15
199	B	18.8	178	40	17	-20	1.0	6.3	.03	.1
200	B,A,C,D	17.0	>200	42	-	15	-	-	.04	.8
201	C	15.3	220	-	34.3	5	.68	2.85	-	.4
202	C	8.2	132	89.0	24	0	1.70	7.45	.012	.8
203	C	18.8	208	73.8	26	0	.63	5.98	-	.2
204	C	13.8	184	61.2	20	0	.64	6.78	.008	.2
205	C	19.5	205	-	40.0	30	.70	6.28	.010	.6
206	C	19.5	260	36.4	15.6	0	.43	5.29	.016	.10
207	C	11.8	175	108.6	26.5	15	.611	2.69	.015	.15
208	C,E	18.4	230	116.5	-	40	1.24	5.05	.053	.3
217	E,C,G	13.7	170	-	-	0	-	-	-	-
224	G,E,C	2.3	>150	91.2	21	15	.87	10.13	.028	.2
Average (13 samples)		15.2	-	73.2	24.6	-	0.96	5.98	0.024	0.33
Minimum		2.3	132	36.4	15.6	-20	0.43	2.69	0.008	0.10
Maximum		19.5	260	116.5	40.0	40	2.06	10.13	.053	.8
Southern region: District D										
209	D	18.0	198	38.38	15	-15	0.73	8.64	0.04	0.10
210	D	16.1	210	76.0	23.0	-15	1.58	4.22	.026	.10
200	B,A,C,D	17.0	>200	42	-	15	-	-	.04	.8
221	G,D	14.4	220	130	35	40	2.70	3.8	.05	.2
Average (4 samples)		16.4	-	71.6	24	-	1.67	5.55	0.039	0.30
Minimum		14.4	198	38.38	15	-15	0.73	3.8	0.026	0.10
Maximum		18.0	220	130	35	40	2.70	8.64	.05	.8
Central region: Districts E, F, and G										
211	E	19.5	168	110	25.4	0	0.50	6.0	0.009	0.2
212	E	16.5	170	3/ 19.57	-	-15	1.26	-	.03	.3
213	E	13.1	190	-	38	20	1.60	-	.19	.3
214	E	16.2	162	54.0	19	0	.90	7.70	.040	.8
215	E	14.1	158	-	20	<-10	3.28	9.94	.014	.20
216	E	22.0	255	64.7	-	0	1.50	4.6	.04	.25
217	E,C,G	13.7	170	-	-	0	-	-	-	-
218	G	7.0	215	58.0	-	0	.8	8.4	.02	.1
219	G	13.8	165	3/ 14.16	11	-10	.67	5.2	.04	.2
220	G	16.0	245	-	32	15	.92	11.8	.05	.2
221	G,D	14.4	220	130	35	40	2.70	3.8	.05	.2
222	G,E	11.7	240	46.06	-	-5	.910	-	.03	.2
223	G,E	17.0	242	-	22.7	20	.882	6.3	.03	.20
224	G,E,C	2.3	>150	91.2	21	15	.87	10.13	.028	.2
225	G,E,F	9.2	190	-	22	-10	1.42	-	.054	.3

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226	G,E,I	4.8	245	49.98	-	-15	.810	-	.003	.2
227	G,F,E,I	6.0	240	47.32	-	-5	1.31	-	.09	.15
208	C,E	18.4	230	116.5	-	40	1.24	5.05	.053	.3
231	H,L,K,F	10.9	245	77.7	22.5	-10	3.40	10.2	.016	.2
Average	(19 samples)	13.1	-	76.9	24.4	-	1.39	7.43	0.044	0.25
Minimum		2.3	158	46.06	11	-15	0.50	3.5	0.003	0.1
Maximum		22.0	255	130	38	40	3.40	11.8	.19	.8

Rocky Mountain region: Districts H, I, J, and K

228	H	7.4	162	-	36.0	30	3.15	8.2	0.01	0.1
229	H,K,L,I	17.5	306	162	38	40	4.8	4.4	.01	Trace
230	H,L	10.1	130	-	40	15	2.46	8.7	.03	-
231	H,L,K,F	10.9	245	77.7	22.5	-10	3.40	10.2	.016	.2
232	I	6.2	206	-	18	10	2.90	5.8	.002	.1
233	K	20.2	300	-	35.5	60	1.20	.61	.01	.10
234	K	15.6	170	-	21.0	40	1.39	1.05	.05	.2
226	G,E,I	4.8	245	49.98	-	-15	.810	-	.003	.2
227	G,F,E,I	6.0	240	47.32	-	-5	1.31	-	.09	.15
Average	(9 samples)	11.0	-	-	30.1	-	2.38	5.57	0.025	0.13
Minimum		4.8	130	47.32	18	-15	0.810	0.61	0.002	Trace
Maximum		20.2	306	162	40	60	4.8	10.2	.09	0.2

Western region: Districts L, M, and N

235	L,M	12.3	204		28.3	-15	0.96	7.41	0.05	0.2
236	L,M	13.9	200	-	33.0	-15	.90	9.1	.03	.20
237	L,M,N	15.6	214	-	30	5	1.10	14.4	.03	.2
238	L,N	11.8	176	-	34.0	-15	1.73	11.0	.05	.10
239	N	15.2	155	-	35	15	2.9	-	.07	.2
240	N	18.5	200	-	34	20	.5	3.80	.01	.1
241	N	13.5	170	-	30	0	1.30	12.0	.06	.20
242	N,L	15.2	198	-	27	5	1.69	8.52	.04	.1
243	N,L,M	12.9	184	-	32	5	1.4	8.0	.05	.1
244	N,M	17.4	194	-	39.0	-20	.94	3.88	.02	.10
245	N,M,L	14.7	174	-	32	10	3.5	7.0	.05	.02
229	H,K,L,I	17.5	306	162	38	40	4.8	4.4	.01	Trace
230	H,L	10.1	130	-	40	15	2.46	8.7	.03	-
231	H,L,K,F	10.9	245	77.7	22.5	-10	3.40	10.2	.016	.2
Average	(14 samples)	14.3	-	-	32.5	-	1.97	8.34	0.037	0.13
Minimum		10.1	130	77.7	22.5	-20	0.5	3.80	0.01	Trace
Maximum		18.5	306	162	40	40	4.8	14.4	.07	0.20

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 208 and 217 in the Eastern region, items 210 and 200 in the Southern region, items 227 and 208 in the Central region, items 234 and 226 in the Rocky Mountain region, and items 245 and 229 in the Western region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other region.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Not within specification of fuels for this grade, figure not included in average.

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TABLE 10.--Analyses of grade 6 burner fuel oils, 1955

Eastern region: Districts A, B, and C

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity Furol at 122° F. A.S.T.M. D88 Sec.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 100 percent sample, percent	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol.%
246	A,D	6.2	182	206	40	1.24	14.71	0.010	0.4
247	B	11.5	185	180	35	2.45	9.25	.030	.15
248	B	15.9	192	160	40	3/ 1.0	13.4	.04	.3
249	B	14.3	190	160	30	4/ 2.4	15.1	.04	.2
250	B	10.8	188	168	40	2.40	13.8	.05	.3
251	B	14.6	250	151	35	4/ 2.90	8.44	.04	.2
252	B	15.1	154	192	20	3.63	10.89	.05	.4
253	B	15.4	200	78	60	1.9	6.2	.1	.5
254	B,A	10.3	196	170	35	1.81	16.28	.11	.18
255	B,A	8.4	200	221	25	3.25	13.8	.072	.2
256	B,A,D	10.6	190	150.6	25	1.80	-	.04	.05
257	B,A,D	11.3	200	142	-	.60	-	.06	.20
258	B,A,D,C	10.0	>200	173	35	2.32	-	.15	.60
259	B,C	16.7	210	142	75	3/ .77	6.17	.05	.2
260	B,D	7.5	164	163	30	1.42	22.65	.07	.20
261	C	16.0	225	95.2	10	.79	4.06	-	.4
262	C	4.2	210	120	30	1.80	11.1	.012	.6
263	C	7.1	220	150	30	.91	9.0	.010	.4
264	C	17.5	170	69	45	.72	3.85	-	.2
265	C	12.5	212	64	25	.84	10.0	.006	.2
266	C	13.1	190	69	15	.56	6.27	.01	.04
267	C	12.2	195	200	35	.62	6.85	.025	.2
268	C	16.8	240	98.9	25	.77	7.5	.0	.75
269	C	16.5	180	213.5	75	.85	8.42	.036	.5
270	C	14.3	240	290	80	.75	9.4	.012	.6
271	C	14.5	290	275.0	40	.68	7.60	.017	.20
272	C	8.5	260	280	25	.774	2.78	.084	.2
273	C,E	16.0	245	162	50	1.32	6.72	.004	.3
277	D,B	10.8	198	175	20	2.77	-	.10	.12
278	D,B,A	13.0	208	70	10	1.95	9.44	.010	.4
279	D,B,A	9.0	170	240	45	.75	9.0	.03	.2
280	D,B,A,J	7.2	190	185	25	1.5	13.5	.02	.1
288	B,C	14.3	228	236	45	.60	9.0	.014	.3
289	B,C	8.0	180	228	40	.62	16.1	.09	.2
298	C,B,C	3.6	>190	270	35	.87	14.90	.044	.3
Average (35 samples)		11.8	-	169.9	-	1.44	10.19	0.044	0.29
Minimum		3.6	154	64	10	0.56	2.78	0.0	0.04
Maximum		17.5	290	290	80	3.63	22.65	.15	.75

Southern region: District D

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity Furol at 122° F. A.S.T.M. D88 Sec.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 100 percent sample, percent	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol.%
274	D	10.1	200	150	35	1.77	11.75	0.09	0.10
275	D	13.0	152	170	35	.45	4.5	.3	.5
276	D	13.9	205	198	30	1.50	10.51	.052	.190
277	D,B	10.8	198	175	20	2.77	-	.10	.12
278	D,B,A	13.0	208	70	10	1.95	9.44	.010	.4
279	D,B,A	9.0	170	240	45	.75	9.0	.03	.2
280	D,B,A,J.	7.2	190	185	25	1.5	13.5	.02	.1
281	D,E,C	13.9	5/ 355	122.2	80	.719	7.8	.047	.60
246	A,D	6.2	182	206	40	1.24	14.71	.010	.4
256	B,A,D	10.6	190	150.6	25	1.80	-	.04	.05
257	B,A,D	11.3	200	142	-	.60	-	.06	.20
258	B,A,D,C	10.0	>200	173	35	2.32	-	.15	.60
260	B,D	7.5	164	163	30	1.42	22.65	.07	.20
299	C,B,D	12.0	230	170	50	2.86	4.7	.08	.3
Average (14 samples)		10.6	-	165.3	-	1.55	10.85	0.076	0.283
Minimum		6.2	152	70	10	0.45	4.5	0.010	0.05
Maximum		13.9	230	240	80	2.86	22.65	.15	.60

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 273 and 277 in the Eastern region and items 281 and 246 in the Southern region, are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other region.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Designated low-sulfur fuel. 4/ Designated high-sulfur fuel. 5/ Flash point by Cleveland open cup method, A. S. T. M. D92-52.

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TABLE 10.--Analyses of grade 6 burner fuel oils, 1955 (Cont.)

Central region: Districts E, F, and G

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity, Furol at 122° F. A.S.T.M. D88 sec.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 10 percent residuum, percent	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %
282	E	15.8	190	85	40	2.70	-	0.03	0.2
283	E	11.5	166	175	45	3/ .98	10.80	.045	.8
284	E	13.8	172	250	45	4/1.30	12.40	.048	.6
285	E	8.4	160	204	40	3.42	13.76	.052	.30
286	E	23.2	430	91.1	75	.70	4.16	.034	.50
287	E	6.3	255	128.2	30	1.11	1.30	.03	.20
288	E,C	14.3	228	236	45	.60	9.0	.014	.3
289	E,C	8.0	180	228	40	.62	16.1	.09	.2
290	E,F,G	11.5	>230	70	-	.90	7.5	.11	.3
291	G	14.6	200	290	-	.90	18.0	1.9	.2
292	G	7.8	165	215	30	.9	14.5	.1	.3
293	G	2.0	270	6/ 44	20	.9	10.5	.03	.1
294	G	13.5	250	145	30	1.13	13.2	.1	.2
295	G	13.1	275	275	35	1.39	15.0	.1	.2
296	G,E	16.8	325	131	30	1.00	-	-	.1
297	G,E	14.2	175	290	30	1.20	20.8	.03	.5
298	G,E,C	3.6	>150	270	35	.87	14.50	.044	.3
299	G,E,D	12.0	230	170	50	2.86	4.7	.08	.3
300	G,E,F	13.8	210	295	40	.9	13.65	.355	.5
301	G,E,F	11.2	5/ 360	278	50	.982	13.08	.065	.2
302	G,E,F	-1.1	310	131	40	1.33	-	.04	.3
303	G,F,E	2.2	325	124	45	.949	-	-	.2
304	G,F,E	.0	208	289	45	1.36	20.9	.02	.1
305	G,F,E	8.1	215	265	45	.73	17.7	.05	.3
273	C,E	16.0	245	162	50	1.32	6.72	.064	.3
281	D,E,G	13.9	5/ 355	122.2	80	.719	7.8	.047	.60
307	H,F,E	6.0	180	265	40	3.4	17.5	.4	.5
311	H,L,K,F	8.4	250	89.6	20	3.46	14.2	.026	.2
Average (28 samples)		10.3	-	195.3	-	1.38	12.41	0.150	0.32
Minimum		-1.1	160	70	20	0.60	1.30	0.014	0.1
Maximum		23.2	430	295	80	3.46	20.9	1.9	.8

Rocky Mountain region: Districts H,I,J, and K

306	H	4.5	188	278	35	3.24	15.0	0.01	0.2
307	H,F,E	6.0	180	265	40	3.4	17.5	.4	.5
308	H,K,L,I	14.9	420	115	60	5.25	5.7	.07	Trace
309	H,L	9.0	150	70	25	2.4	13.7	.03	.2
310	H,L,K	7.8	200	146.1	35	2.50	3.75	.015	.9
311	H,L,K,F	8.4	250	89.6	20	3.46	14.2	.026	.2
312	I	10.6	5/ 430	276.1	50	.621	6.74	.031	1.0
313	I	6.7	194	162	55	2.98	7.81	.011	Trace
314	I	10.3	190	290	60	.40	13.0	.11	.5
315	I	10.5	180	150	50	.8	13.0	.04	.3
316	I	6.7	222	170	30	2.96	12.4	.006	.1
317	J	10.2	180	97.5	30	1.31	16.54	.019	1.0
318	J	6.8	197	203	35	1.53	21.20	.032	1.8
319	K	20.2	300	6/ 35.5	60	1.20	.61	.01	.10
320	K	15.8	300	135.0	60	1.40	.89	.02	.10
321	K	15.1	200	51.2	55	1.45	1.33	.08	.2
280	D,B,A,J	7.2	190	185	25	1.5	13.5	.02	.1
Average (17 samples)		10.0	-	167.7	-	2.14	10.40	0.055	0.42
Minimum		4.5	150	51.2	20	0.40	0.61	0.006	Trace
Maximum		20.2	420	276.1	60	5.25	21.20	.4	1.8

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 305 and 273 in the Central region, and items 321 and 280 in the Rocky Mountain region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other region.

2/ Some of the determinations were made by the Conradson method, A. S. T. M. D189-52, and the data converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

3/ Designated low-sulfur fuel. 4/ Designated high-sulfur fuel.

5/ Flash point by Cleveland open cup method, A.S.T.M. D92-52.

6/ Not within specification of fuels for this grade, figure not included in average.

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TABLE 10.--Analyses of grade 6 burner fuel oils, 1955 (Cont.)

Western region: Districts L, M, and N

Item	Distributed in districts 1/	Gravity A.S.T.M. D287 ° A.P.I.	Flash point A.S.T.M. D93 °F.	Viscosity, Furol at 122° F. A.S.T.M. D88 sec.	Pour point A.S.T.M. D97 °F.	Sulfur content A.S.T.M. D129 percent	Carbon residue Ramsbottom 2/ A.S.T.M. D524 on 100 percent sample, percent	Ash A.S.T.M. D482 percent	Water and Sediment A.S.T.M. D96 vol. %
322	L,M	10.4	214	107.0	25	0.90	13.5	0.04	0.20
323	L,M	9.6	214	170.0	30	.95	14.2	.05	.20
324	L,M,N	8.5	230	175	35	1.35	17.6	.06	.2
325	L,M,N	9.0	210	100	5	1.25	15.9	.04	.2
326	L,M,N	8.0	220	160	30	1.37	17.3	.05	.2
327	L,M,N	10.5	214	236	40	1.53	18.1	.05	.3
328	L,N	9.3	172	109.0	20	1.79	13.1	.06	.10
329	L,N	8.1	196	174.0	30	1.70	14.1	.06	.20
330	M,L	8.8	196	169	25	.95	-	.05	.3
331	N	9.5	158	200	30	4.4	18	.1	.2
332	N	15.6	200	110	30	.5	4.56	.01	.1
333	N	14.5	200	171	35	.5	4.56	.01	.3
334	N	9.0	180	200	30	1.50	12.0	.11	.20
335	N,L	8.9	178	173	30	1.68	-	.07	.1
336	N,L,M	10.1	185	110	20	1.5	14	.06	.1
337	N,L,M	8.0	180	180	25	1.7	15	.06	.2
338	N,M	9.4	168	106.0	15	.92	13.7	.02	.10
339	N,M	7.9	184	202.0	25	.86	16.0	.03	.10
340	N,M,L	12.1	172	120	20	4.0	12	.07	.03
341	N,M,L	10.5	180	180	25	4.4	13	.08	.1
308	H,K,L,I	14.9	420	115	60	5.25	5.7	.07	Trace
309	H,L	9.0	150	70	25	2.4	13.7	.03	.2
310	H,L,K	7.8	200	146.1	35	2.50	3.75	.025	.9
311	H,L,K,F	8.4	250	89.6	20	3.46	14.2	.086	.2
Average (24 samples)		9.9	-	148.9	-	1.97	12.91	0.091	0.30
Minimum		7.8	150	70	5	0.5	3.75	0.01	0.05
Maximum		15.6	420	236	60	5.25	18.1	.11	.9

1/ District letters refer to the areas in which the fuels are sold (see fig. 1). In each item the arrangement of district letters indicates in decreasing order the relative volumes of the fuel. Fuels listed above the lines separating items 341 and 308 in the Western region are generally sold in greatest volume in those respective regions. The fuels listed below the lines are generally sold in lesser volumes in the respective regions than in some other regions.

2/ Some of the determinations were made by the Conradson method, A.S.T.M D189-52, and the data were converted to Ramsbottom values using table 1 and figure 4 in the appendix of the Conradson method.

Int.--Bu. of Mines, Pgh., Pa. 7073

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